

THURSDAY, AUGUST 5, 1875

## AMERICAN GEOLOGICAL SURVEYS

THE United States of America have certainly done noble work in the exploration and mapping of their vast empire. Most of the long-settled States have for many years possessed elaborate maps and reports upon the topography, geology, and agricultural features of their territory. The central Government has likewise carried on extensive and admirable coast surveys, besides innumerable expeditions and surveys for opening up the less known or wholly unvisited regions of the interior of the continent. Were all the literature connected with this subject gathered together it would be found to form of itself a goodly library. Some of it has been published in most costly and indeed luxurious style; other portions, and these sometimes not the least interesting or valuable, have to be unearthed from the pages of flimsily printed "blue-books." But whatever be their external guise, these narratives are pervaded by an earnestness and enthusiasm, a consciousness of the magnitude of the scale on which the phenomena have been produced, and yet a restrained style of quiet description, which cannot but strike the reader. Their writers have evidently had their feelings of awe and admiration worked sometimes up to the highest pitch, yet they contrive on the whole to present just such plain frank statements of facts as to convey clear and definite notions of the regions they describe. Though little is said about hardships and hair-breadth escapes, one can see that these bold explorers could not have accomplished what they so modestly and quietly narrate without a vast amount of privation and danger. Some of them, indeed, like poor young Loring in 1871, have lost their lives by Indian assassins, others have fallen victims to the disease and debility necessarily attendant on so much exposure. But on the whole the work seems to be healthy, and the men engaged upon it like it and keep to it.

Leaving for the present the consideration of what has been done and is now doing in the more settled States, let us turn to those vast territories lying to the west and stretching across the Rocky Mountains to the shores of the Pacific. At the beginning of this century comparatively little was known of these regions. But the Government then resolved to gather some information on the subject, and with that end despatched an expedition in 1804 which penetrated the wilderness, reached the western sea-board, and after much hardship brought back a first instalment of knowledge regarding this part of the continent. During the period preceding the year 1851, somewhere about forty exploring and survey parties were sent by the War Department into the tracts lying to the west of the Mississippi. But in the next twenty years, viz., from 1850 to 1870, the same Department conducted forty-six of these surveys, not merely for military purposes, but to aid in the general opening up of the vast unexplored territories. As a rule, however, and until comparatively recently, these expeditions could make no pretensions to geographical accuracy. Their object was merely to fix as well and as rapidly as might be the positions of main landmarks, and to collect such informa-

tion as to the nature of the country as was most needful, with the view to its early settlement.

But the discovery of gold in California at once drew attention to the western slope, and awakened a strong desire to open up a better and more expeditious communication with it than had previously been in use. The Pacific Railroad was projected, and surveys were made to ascertain the best routes. In the course of these explorations much additional information was obtained, but still in such necessarily rapid work there could be little done towards accurate geographical and topographical determinations. Hence we find that prominent points were sometimes placed from three to twenty miles out of their true position. Nor could much be attempted of any value in a geological point of view. It is seldom that a single traverse of the rocks of a wide region can be understood without a knowledge of the country lying on either side of it.

In a region of which no reliable maps exist, it is of course impossible to conduct a geological survey except in connection with a topographical one. The geologists must either make their own topographical maps, or be accompanied by surveyors who do that for them. Previous to the year 1867 no special geological exploration seems to have been carried on in the territories as the work of any Government Department. But in that year no fewer than three separate and independent geological surveys were organised. One of these, under the direction of the War Department, but conducted entirely by civilians, with Mr. Clarence King at their head, made a careful examination of a tract about a hundred miles broad, stretching along the fortieth parallel, from the eastern boundary of California to the eastern slope of the Rocky Mountains. A second survey, under the direction of the Smithsonian Institution, with Mr. J. W. Powell in charge, had as its task the exploration of the Colorado of the West and its tributaries. A third survey, or series of surveys, has been conducted with great zeal by the Department of the Interior over a vast range of country embracing Nebraska, parts of Colorado and New Mexico, Wyoming, Utah, Montana, and Idaho. These surveys have been under the guidance of Dr. F. V. Hayden.

There appears to have been no concert between the different Government Departments in the organisation and conduct of these various geological explorations. Each survey party was sent out as if it had the boundless wilderness to subdue without the aid of any compatriots or even the chance of seeing human beings save hostile Indians. The Territories, though vast, were not infinite, and it was to be expected that some time or other the independent survey parties should meet. This does not seem to have happened for some years. Meanwhile, however, Dr. Hayden's expedition, supported by increasingly liberal grants from Congress, was doing most excellent work, making a good general map, and at the same time bringing before the world an annual report full of most interesting and valuable and sometimes remarkably novel information regarding the geology and natural history of the regions visited. The War Department, with a far more powerful organisation, and with the help of a staff of trained civilians, was much more deliberate in its movements. Very little of its work had seen the light, though of the excellence and copiousness of that work

there was no reason to doubt. As the Department had been for more than half a century in undisputed command of the exploratory expeditions of those western regions, perhaps some of its more zealous functionaries may have grown somewhat jealous of the increasing popularity of the work done by the Department of the Interior, and may have looked upon that work as an unwarrantable encroachment upon the recognised province of the military corps. Be this as it may, a chance meeting of two independent survey parties in 1873, and the fact that to a certain extent they both surveyed the same ground, led to a battle royal in the spring of last year, wherein appeared the chiefs of the Departments with President Grant at their head, military men, geologists, naturalists, topographers, and several cohorts of professors. Evidently some of the parties knew that the contest would come sooner or later, and were prepared accordingly. The first bomb-shell was thrown as it were by an outsider, on the 15th of April, 1874, when Mr. Lazarus D. Shoemaker carried a resolution in Congress requesting the President to inform the House what geographical and geological surveys were carried on by the Government in the same or contiguous areas of territory lying to the west of the Mississippi, and whether these could not be combined under one Department, or at least have their respective geographical limits defined.

The question thus raised turn out to be really whether the War Department should have entire control of the surveys, both those intended for military and those for purely civil purposes. The President replied that they would be more economically and quite as efficiently carried on by the military authorities. Not content with this recommendation of its military chief, Congress referred the matter to its Committee on Public Lands. A careful investigation followed, and though the military side fought hard for its supremacy, the Committee decided against the purposed consolidation. Their conclusions ran thus: "That the Surveys under the War Department, so far as the same are necessary for military purposes, should be continued; that all other Surveys for geographical, geological, topographical, and scientific purposes should be continued under the Department of the Interior, and that suitable appropriations should be made by Congress to accomplish these results."

There can be little doubt that though it must have chagrined some sanguine partisans whose ebullitions of temper form an amusing feature in the congressional blue-book, this decision of the Committee was in the circumstances a wise one, and one which, followed out by the Government, will have an important influence in the development of the vast and still unexplored regions over which the surveys have yet to extend. It is impossible that the corps of Engineers, weighted with all the numerous and arduous duties which form its ordinary work, should be able to furnish the necessary complement of trained geologists, botanists, naturalists, and other scientific men for the adequate exploration of the territories. In fact, the scientific work of that corps has all along been done in great measure by civilians. But it is neither needful nor desirable that civilians of high training in practical scientific work should be placed under military direction. They move more freely without it. And as in the Western Territories they declare that they no

longer need the protection of an escort, the sole remaining reason for a military supervision would seem to be removed.

The Surveys of the Department of the Interior claim the first place from their voluminousness and from the wide area to which they refer. As already mentioned, they have been carried on since their beginning by Dr. F. V. Hayden, to whose skill in geological work, and tact in diplomatic relations with Government bureaux, officials, and fellow-labourers in science, their success is certainly in large measure due. For the last twenty-two years he has given himself to the exploration of the north-western territories. In the spring of 1853 he ascended the Missouri in one of the American Fur Company's steamboats and spent three years up there, during which time he accumulated considerable collections in natural history. In 1856 he joined an expedition of the Engineer Topographical Corps to that region as surgeon and naturalist. On the outbreak of the Civil War he took service in the Federal Army, as Surgeon of Volunteers, and served four years. But when the war ended, finding himself out of employment, he in 1866 returned to the north-west on his own resources, and resumed his researches in the natural history of that region. In the following year, Congress having made a small grant of \$5,000 towards a Geological Survey of Nebraska, Dr. Hayden received the charge of it. This was the beginning of his career as Government geologist. But his path was not strewn with roses, either amid the hills of Nebraska or in the Government Offices at Washington. The sum appropriated for his survey in 1867 was the unexpended balance of the grant for the legislative expenses of the territory. He had a sore fight to get it renewed next year. But in 1869 Congress took up the question in a broader spirit, and sanctioned a general geological survey of the Territories of the United States, with an appropriation of \$10,000 to be administered by the Department of the Interior. Since that date, owing no doubt to the marked success of the Survey, the grant has grown rapidly in amount, till at present it stands at \$75,000.

This great increase in the amount of funds at his disposal has enabled Dr. Hayden to augment and equip his staff to an extent very different from that of his modest beginning in 1867. According to his last published report he organises his force into three geological parties, each completely furnished and able to act independently, so that if desired it could be transferred to any portion of the public domain. Each of these parties consists of a topographer, an assistant topographer, a geologist, two packers, a cook, and usually two or three others as general assistants or collectors in natural history. But besides these he has still three other parties, one for the purpose of carrying on the primary triangulation of the country and thus correcting and harmonising the trigonometrical work of the other or geological explorers, a second for procuring photographs and information likely to be useful to the other parties and the public, and a third, and not least important, the quartermaster's party, for furnishing supplies to all the others. These three last-named parties traverse the entire field of work.

A mere inspection of the catalogue of the publications of the Geological Survey of the Territories is enough to



show what an enormous amount of work has been got through in seven years. First of all there is an Annual Report of Progress, in which, without waiting for completed surveys, the general results of each year's work are given, in geology, palæontology, mineralogy, natural history, meteorology, archæology, and economic products of every kind. Then come what are called Miscellaneous Publications and "Bulletins"—little pamphlets giving data in meteorology, topography, natural history, or other information gathered in the course of the Survey. Next we have large quarto monographs, admirably printed and illustrated, devoted to the discussion of the more technical and matured results, such, for instance, as the palæontology of a wide region or of a formation. Lastly, a series of topographical maps of parts of the districts surveyed has been published. These will be of great value as a basis for the general map to be afterwards constructed. Geologists in this country accustomed to the elaborate geological maps issued by our Government, may perhaps at first wonder why geological maps, properly so called, do not appear among the publications of the Geological Survey of the Territories. But the delay in the issuing of a general map is as necessary as it is prudent. A report may be written of what one sees. It is complete in itself; and if it is found to contain errors, these can be corrected in a subsequent report. But a sheet of a geological map must fit accurately to its neighbours. If it is surveyed and published without waiting for the investigation of the surrounding area, it will most probably be found somewhere, at least, erroneous; and to make it harmonise with adjoining sheets may require so much alteration as to demand, perhaps, even the cancelling of the old and the engraving of a new plate. Therefore we are content to wait for Dr. Hayden's geological map of the Territories in confident anticipation that it will be worthy of the high reputation which he and his staff have already gained.

It should be added, that with the most praiseworthy liberality the publications of the Survey are distributed as gifts to learned bodies and scientific men all over the world. All that is asked is that, where possible, the scientific publications of the recipients of the volumes may be sent in exchange. It is to be hoped that this generous spirit has called forth a similar feeling elsewhere, and that the library of the Geological Survey of the Territories is continually augmented by presents from all parts of the world.

ARCH. GEIKIE

#### FISKE'S "COSMIC PHILOSOPHY"

*Outlines of Cosmic Philosophy, based on the Doctrine of Evolution, with Criticisms on the Positive Philosophy.*

By John Fiske, M.A., LL.B., Assistant Librarian, and formerly Lecturer on Philosophy, at Harvard University. 2 vols. (London: Macmillan and Co., 1874.)

WE have repeatedly expressed our admiration of the system of philosophy which Mr. Spencer is engaged in working out. Mr. Fiske, in giving an outline of this philosophy, has called it *Cosmic*; a name which he thinks peculiarly fitting, because "the term 'Cosmos' connotes the orderly succession of phenomena quite as forcibly as it denotes the totality of phenomena; and with anything absolute or ontological, with anything save the 'Mundus' or orderly world of phenomena, it has nothing

whatever to do." But Mr. Spencer is far from ignoring the absolute, and the ontological element in his speculations has frequently been the subject of criticism; and surely Mr. Fiske goes beyond an account of the orderly succession of phenomena in all that he has to say about the "Infinite Power manifested in the world of phenomena," which he finds that we are clearly bound to symbolise as quasi-psychical rather than as quasi-material, so that we may say with meaning, "God is Spirit, though we may not say, in the materialistic sense, that God is Force."

As the Evolution-Philosophy, which is for the most part but higher science, has swallowed up the rival systems of former times, and now stands itself without a rival, we need not pause to speak of its merits. Our first duty then is to acknowledge that Mr. Fiske has succeeded in giving a very faithful and attractive sketch of Mr. Spencer's philosophy. He has made all the thoughts his own, and has, we should think, secured for himself a recognised place among the most advanced thinkers of our time. But Mr. Fiske claims that his work shall be regarded as more than a mere reproduction of Mr. Spencer's thoughts. It contains "much new matter, both critical and constructive." In relation to the evolution of society, the author supposes he has anticipated what "will doubtless be much more thoroughly and satisfactorily presented by Mr. Spencer in his forthcoming work on Sociology." Without stopping to inquire whether a love of system may not here, as elsewhere, have led to a slight waste of energy and a straining of words, it must without doubt be recognised that Mr. Fiske has expressed with clearness and ability many large and important truths, the recognition of which must have a very healthy and elevating effect. Nothing can be better than for people to reflect that moral progress consists in the continual "adaptation of the desires of each individual to the requirements arising from the co-existent desires of all neighbouring individuals." Again, the superiority of a true philosophy over some modes of thought which still claim to be the most advanced, may be learned from Mr. Fiske's profound appreciation of the vital part played by the Roman Church in the evolution of European civilisation.

The original matter, however, on which the author lays most stress, refers to the genesis of man. He works out a theory as to the part taken by the prolongation of human infancy in originating social evolution, which, in his own words, "is entirely new in all its features." To account for the passage from mere gregariousness to sociality as marked by permanent family groups, is the problem Mr. Fiske has set himself, and his solution is this:—Mr. Wallace has given a most beautiful exposition of the operation of natural selection at that point in the evolution of man from a lower form when variations in intelligence began to be seized on and preserved rather than variations in bodily structure. It was then that our remote progenitors began to clothe their bodies and to prepare their food, that the ape of many devices survived where his perhaps stronger or swifter contemporaries perished. Now, increase in intelligence, says Mr. Fiske, implies increase in size and complexity of brain; and, as a matter of observation, this structure, as it becomes more and more complex, is less and less definitely organised at